Solar and Wind Grid Isolation architecture

Proposal to secure the electric grid reliability

Purpose: To prevent intermittent, uncontrollable, and unreliable solar and wind power generation systems including the home-based systems to be imposed on the electrical grid compromising its reliability.

This is a security issue for all customers served by an electrical power grid.

Why do we need this?

The so-called renewable power generation of solar and wind are intermittent and that is a fact that cannot be disputed. They operate on the whims of the atmospheric conditions and in the case of solar power, it becomes inactive when the sun goes down. Even when the sun is shining, the solar power output is variable depending on the time of the day, latitudinal location of the site and the time of the year. They are uncontrollable. The wind generation needs a steady wind speed and a minimum wind speed of 7 mph. Wind velocity is variable, and the output of the generator follows the wind speed and becomes inoperable beyond 40mph due to mechanical constraints. These power sources are unreliable to be connected to an electrical grid.

The electrical grid is just a set of wires with transformers along the way to carry electrical energy from generating source to the end users without any practical and viable method of storing electricity. Batteries are not efficient due to their extreme limitations on storage density and volume. Batteries are useful at low energy consumption levels such as at home, golf carts, etc. The electrical energy produced and consumed via the grid system must be in balance all the time. Any mismatch will result in voltage volatility that must be controlled by altering the level of power generation connected to the grid or managing the demand or both. In other words, the demand must be met. Any built-in unreliability via the renewable power generation device will destabilize the electrical grid. As we increase our dependence of electrical power on demand because of the proliferation of appliances including the promotion of plug-in automobiles and electronic devices, there will be a growth in electric power consumption per capita. Knowingly connecting unreliable, intermittent, and uncontrollable power sources to the grid when our demand for electrical power is increasing cannot be a rational engineering decision. Unfortunately, any other wishful thinking compelling us to do cannot overcome the rigid laws of physics.

According to the projections by the South Carolina utilities (South Carolina Generation and Capacity Mix Report), the solar power connected to the grid is expected to grow to 5% to 7% in 2030 pro rata basis, summer usage. The expected unreliability to the grid will have to be covered by equivalent standby units that operate with our ability to control which means most likely, natural gas power plants, perhaps cogeneration. You need to grow the reserve capacity

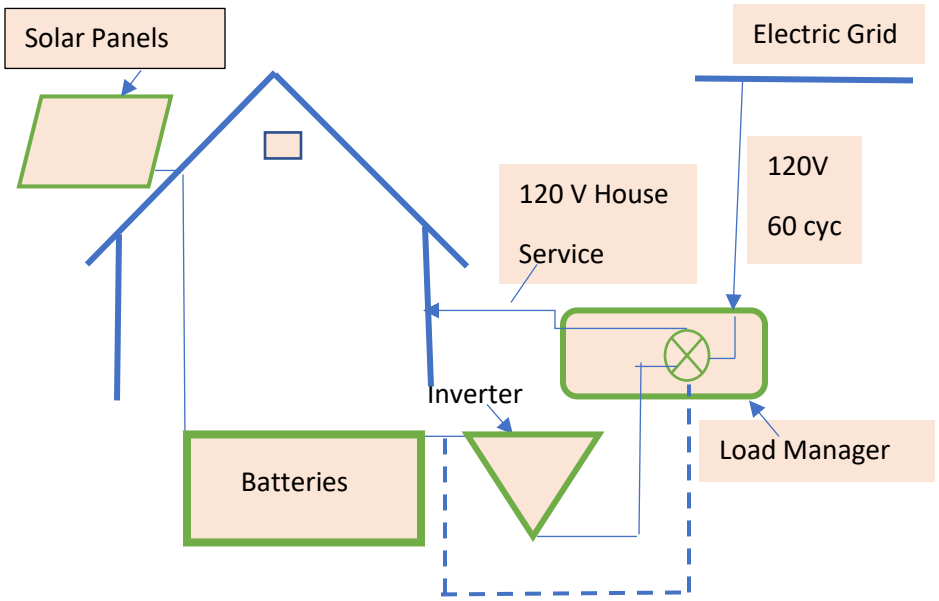
to take care of maintenance outage as well as deal with the reliability issues introduced into the grid. The idea that is put forth that the future growth of demand for electrical power can be met by bringing on more renewables without the reliable backups at standby is a myth. The cost of generation of that incremental power has gone up (Solar or wind installation plus the standby source, ready and available) because of that need.

The SC Energy Freedom Act empowers a homeowner with a solar power generation device to be able to connect to the grid and be able to sell the power thus generated at the same retail rate that the consumers pay to the utilities. I have nothing against the idea of a homeowner installing solar power or any other method of generating electricity for self-use. However, as a customer depending on the grid reliability for electric power maximizing its availability, my interests are compromised when the government incentivizes connection of an unreliable, intermittent, and uncontrollable retail power sources. I propose a power grid isolation architecture that, while allowing the individual homeowners to generate power for their own use, will not be able to push that power into the grid. The homeowner will still be serviced by the grid when that homeowner is unable to self-generate his/her power needs. It will only be a one-way distribution of power and basically no different than the customer connections to the utility. The grid operator does not have to worry about the inherent unreliability of renewable power in the grid system, improving the grid stability and its manageability. The grid operator has to worry only about supply or demand variability.

Additional feature of this system is the customers that solely depend on the grid for their electrical power needs will not have to subsidize via tax incentives and rate charges those types of installations. As you had stated in your letter, the SC government provides tax incentives to those installing those types of domestic power generation while the federal government provides subsidies for installation as well. Those shortfalls have to be paid by others that have no connection to this scheme. That is a different topic, and I will stop my comments on it here.

How about the installations by the utilities themselves with the solar farm, etc.? That will be no different in that it introduces the inherent unreliability of that system, except in a concentrated form at one location. In order to maintain grid safety, the farm must have equivalent standby generating capacity to avoid blackouts. Until we have a viable and economical large scale electric storage system (reservoirs in a hydro system plays this role), connecting the renewable power system to the grid introduces grid stability risks.

Below is a description of a potential system that isolates the reliability problems of the wind and solar power generation from affecting the vital stability requirement of the electrical grid. Just witness what has happened in Texas last winter when the electrical grid carries about 23% of power generation from wind farms. California is another example of blackout problems with solar power generation sources attached to the grid while deducting the reliable fossil-fuel type modern power systems. I will stop here before digressing into discussing the misnomer of “clean energy” attributed to wind and solar.



Load Manager (LM): Monitors battery charge status; establish a threshold at which LM will isolate the battery system, allowing grid to supply

No reverse flow into the grid

Battery sizing: 2 times the average daily KWHR, about 3 KW.

Suggested architecture would prevent grid loading from the battery system